REMARKS/ARGUMENTS

Applicant would like to thank the Examiner for the thorough review of the present application. Based upon the amendments and the following remarks, Applicants respectfully request reconsideration of the present application and allowance of the pending claims.

The Present Invention

The present invention relates generally to optoelectronic devices and, more particularly, to optical interconnects formed from sol-gel material that has an active region. Optical interconnects made from sol-gel based materials are highly beneficial because sol-gel imparts flexibility to the optical interconnect devices.

Prior to the present invention, sol-gel based interconnects were limited to passive devices because sol-gel is, by nature a high loss material, and attempts to provide for an active region within sol gel proved problematic.

In conventional active optical interconnects the base material is glass or some form of silica based material. In these conventional active optical interconnects the active region is formed by doping the base material with ions, such as rare earth ions, like erbium, ytterbium or the like. In glass or silica based materials, the dopant chemically bonds with the base material and becomes part of the overall matrix.

In sol-gel based interconnects doping with ions, such as rare earth ions, like erbium, ytterbium or the like does not result in chemical bonding but rather the ions become dispersed in the material. However, merely adding rare earth ions to sol-gel does not provide for the requisite active region within an optical interconnect. This is because, the rare earth ions have a general tendency to cluster when added to sol-gel material and, thus do not readily provide for uniform dispersion. The clustering of the rare earth ions is not conducive to an energy transfer when the optical interconnect is bombarded with photons, and thus no active region within the device results.

The present invention provides for rare earth ions dispersed within the sol-gel material, such that an active region results in the sol-gel based material. The active region is realized because the rare earth ions are enclosed, commonly referred to in the art as caged, in a tris (8-hydroxyquinoline) molecule, referred to as "Q" form of the rare earth ions. In the "Q" form the rare earth ions act bigger than their actual size and, thus, have a far less tendency to cluster when dispersed in the sol-gel based material. In addition, since the ions appear to be physically bigger in size, they are easier to activate (i.e., realize energy transfer) when subjected to photon bombardment. By providing for greater activation realization, a greater gain can be realized in the active region, which offsets the loss incurred due to the general high loss nature of the sol-gel based material.

35 U.S.C. § 102 (b) Rejections

Claims 97-100, 103-111 and 113 stand rejected under 35 U.S.C. 102 (b) as being anticipated by United States Patent No. 5,480,687 issued to Hemming et al. (the Heming '687 patent), Japanese Patent Application No. JP 1999202143 and the technical article published in Electronics Letters, Vol. 31, No. 4, 02/95, entitled "Sol-gel integrated optical coupler by ultraviolet light imprinting", Li et al.

The Heming '687 patent, Japanese Application No. 1999202143 and the Electronic Letters article to Li et al. Do Not Teach an Optical Interconnect Device formed of a Sol-Gel Based Material Having an Active Region Defined Within the Sol-Gel Material.

While the Examiner states that the three cited references clearly teach the present invention, the Applicant is unable to appreciate any teaching beyond sol-gel based materials being used to form *passive* devices.

The present invention and, in particular Claim 97 of the present application claims a planar optoelectronic device (i.e., waveguide) that comprises a sol-gel based material with an

active region defined within the sol-gel based material. As such, the optoelectronic device described and claimed in the present invention is an active optoelectronic device.

While the three references that have been cited as relevant U.S.C. 102 (b) art do provide a teaching of sol-gel based optical interconnects, the devices that are taught in these references do not include an active region within the sol-gel based material. Therefore, the teaching in these references is limited to passive devices, categorically different than the active device claimed in the present invention. The applicant can find no teaching within these references related to active regions within the sol-gel based materials or any use of dopants, rare earth ions or otherwise, to create an active region within the sol-gel based material.

Thus for the reasons stated above, independent claim 97 and the dependent claims that add further limitations, are distinguishable from the teachings of the three cited references and, thus are patentable.

35 U.S.C. § 103 (a) Rejections

Claims 101, 102, 112 and 114-117 stand rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 5,480,687 issued to Heming et al. (the '687 Heming patent) in view of United States Patent Nos. 5,887,089 (the '089 Deacon patent), 5,363,398 (the '398 Glass patent) and 5,249,195 (the '195 Feldman patent).

The '687 Heming Patent Does Not Teach Sol-Gel Based Optoelectronic Interconnects Having an Active Region Defined in the Sol-Gel Based Material

The '089 Deacon Patent, '398 Glass Patent and the '195 Feldman Patent Do Not Teach Sol-Gel Based Optical Interconnects

As previously discussed, the present invention and, in particular Claim 97 of the present application claims a planar optoelectronic device (i.e., waveguide) that comprises a sol-gel based material with an active region defined within the sol-gel based material.

As previously discussed, the '687 Heming patent provides a teaching of sol-gel based optical interconnects, however, the devices that are taught in this reference do not include an active region within the sol-gel based material.

The '089 Deacon patent, the '398 Glass patent and the '195 Feldman patent provide for active devices, in that the devices may be erbium doped, however, the devices are glass or silica (SiO_2) based devices. In addition, these references do not provide for a teaching of planar waveguides or optical interconnects, but rather vertical cavity type devices.

As discussed above, providing for active region in a glass or silica based device is categorically different than providing for an active region in a sol-gel based optical interconnect. In the glass or silica based device the active region is formed by using a dopant, such as erbium or the like, which will chemically bond to the glass or silica and become part of the matrix structure.

In sol-gel based materials the dopant, such as erbium or any other rare earth ion, will not chemically bond to the sol-gel molecules, but rather must be equally dispersed throughout the desired active region. The general tendency is for the dopant; such as erbium or the like to cluster as opposed to equally disperse. The present invention serves to cage or encase the rare earth ions in a loosely connected molecule, so as to prevent clustering and allow for the dopant to be equally dispersed throughout the sol-gel based material. In addition, the encasing of the rare earth ions make the ions appearing physically bigger in size and, thus, provide better targets for excitation when the device is bombarded with photons during an activation state.

For these reasons, applicant believes that the references cannot be combined under 35 U.S.C. § 103 (a) to obviate the present invention as, claimed.

As such, applicant respectfully submits that independent claim 97, as well as the dependent claims that depend there from, are not obvious by legal standards and, are thus, patentable.

Claim Amendments

Claim 97 has been amended to further define the active region as being included within the sol-gel based material. In addition, the term "flexible" is viewed as an erroneous limitation to the novel features of the claim and as such deleted from the claim.

New Claims

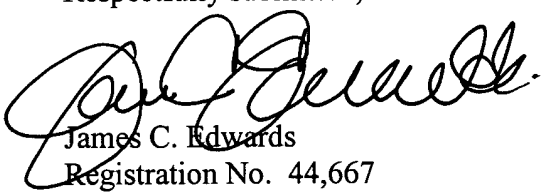
The applicant has added a new claim that further defines the active region within the sol-gel based material. Specifically, the additional dependent claims specify that the rare earth ions are surrounded by a tris (8-hydroxyquinoline) molecule.

Conclusion

In view of the proposed amended claims, new claims and the remarks submitted above, it is respectfully submitted that the present claims are in condition for immediate allowance. It is therefore respectfully requested that a Notice of Allowance be issued. The Examiner is encouraged to contact Applicant's undersigned attorney to resolve any remaining issues in order to expedite examination of the present invention.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



James C. Edwards
Registration No. 44,667

Customer No. 00826
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Charlotte Office (704) 444-1000
Fax Charlotte Office (704) 444-1111

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on Novemebr 7, 2003.

Sarah B. Simmons

Sarah B. Simmons
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